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LIMNOCNIDA INDICA IN AFRICA

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With 3 Text-figures

In summer and autumn 1967, freshwater medusae of the genus *Limnocnida* were observed in Lake Tana (Ethiopia) for the first time. Information about this occurrence is very scanty. It is only known that the medusae were swimming in mass-swarms and the question was raised whether they might be injurious to swimmers. Thus, the Ethiopian Government sent a collection of 23 specimens for species determination via Dr. med. F. SCHÄUFELE, that time at the Feleghe Heiwot Hospitals in Bahar Dar, to the Staatliches Museum für Naturkunde Stuttgart[2]. Since no effect of freshwater medusae on the human skin is known, the first question was answered without hesitation, but species determination raised difficulties.

In addition, 9 specimens of *L. victoriae* were collected for comparison from Lake Kariba (Rhodesia) in September 1969 near the University College of Rhodesia's field station at Sinamwenda and sent by Dr. R.J. PHELPS, University College of Rhodesia, Department of Zoology[2]. Both collections are deposited in the Zoologisches Museum Hamburg, under COE 7514 for the 23 specimens from Lake Tana and under COE 7513 for the 9 specimens from Lake Kariba.

Species Characters

Our knowledge of the species of the genus *Limnocnida* was summarized by BOUILLON (1957 b) in a monographic paper dealing with *L. tanganyicae* mainly. Species as described by different authors and their characters are discussed. According to BOUILLON 3 species are known from Africa and another one from India as listed in Table 1. This is supplemented by some information on *L. victoriae* from GREEN (1960), data from ANNANDALE (1912) on *L. indica* and by the collections from Lake Tana and Lake Kariba.

The number of statocysts, the number of tentacles, and the quotient number of statocysts/number of tentacles (ns/nt) are used to characterize species. These values together with the maximal observed diameter and/or its range are given in Table 1. Another character used for separation of species by BOUILLON, the length of the

1) My thanks are due to Dr. Clifford EDWARDS for correcting the English manuscript.

2) I gratefully acknowledge sampling and sending of the medusae to all persons concerned with it.

tentacles, is excluded from this paper, as shrinkage due to preservation gives no reliable measurements. Only in *L. tanganyicae* asexual reproduction of medusae, budding off from the manubrium of specimens with 9–25 mm umbrella diameter, occurs giving an additional specification, while specimens of 6–15 mm reproduce but sexually showing no further characters than other species. An extraordinary high number of tentacles (650–850) defines *L. congoensis* (BOUILLON 1957 a).

All other numerical values from Table 1 do not differ much from one another. Especially the wide range of numbers and of the ratio of ns/nt makes decisions in species determination difficult. This is well demonstrated by the figures given by BOUILLON (1957 b) for *L. tanganyicae* in the species diagnosis (1. line in Table 1) and by the range outlined in the text (2. line in Table 1). The same holds for *L. congoensis*. In *L. victoriae* the ratio of ns/nt is given as 0.93 by BOUILLON (1957 a and b), as 0.6 by GREEN (1960) for medusae from River Sokoto in northern Nigeria and as 0.56 as an average for the Lake Kariba specimens. On the other hand, it is known that the young medusae bud off from the polyp with 8 tentacles and after some time 16 and 32 tentacles are developed, while the number of statocysts is half this number (GREEN 1960). The number of statocysts and the number of tentacles increase with size, but not necessarily by the same relative amount, which may alter the ratio of ns/nt. This relation may be demonstrated by *L. victoriae* (Table 1), in which the ratio of ns/nt seems to change with size.

Table 1. The taxonomic characters of *Limnocnida* species. (Figures in parentheses are not given by the author, they result from the figures in the other columns).

Species	Number of statocysts	Number of tentacles	ns/nt	Diameter of umbrella, mm	Author
L. tanganyicae	(240)	max. 300	0.8	max. 25	BOUILLON 1957 b
GÜNTHER (1893)	200–300	150–300			BOUILLON 1957 b
L. congoensis	300–400	650–850	0.48	max. 25	BOUILLON 1957 a
BOUILLON 1957 a	(410)	max. 850	0.48	max. 25	BOUILLON 1957 b
L. victoriae	(360)	400	0.93	max. 25	BOUILLON 1957 b
GÜNTHER (1907)	(240)	400	ca. 0.6	max. 19	GREEN 1960
Range	105–188	197–306	0.49–0.70	11–14	This paper for
Average	137	245	0.56	13	Lake Kariba
L. indica					ANNANDALE
ANNANDALE (1912)	128	384	0.33	max. 15	1912
Range	69–241	217–448	0.28–0.59	7–13	This paper for
Average	135	325	0.41	10	Lake Tana

Growth rate, maximum size and size at maturation in many organisms are influenced by environmental factors. This again may result in change of characters in *Limnocnida*, altogether demonstrating that in this genus the ratio of ns/nt is not accurate enough for species determination in each small collection of medusae and especially

not to be used to the second decimal. In this paper values from the literature are cited as given by the authors, but it is hoped that somebody gets the opportunity to check the four species from different localities on the basis of a broad material using the relation of growth to numbers of statocysts and tentacles for species characters as demonstrated for the medusae from Lake Tana.

Limnocnida indica in Lake Tana

The statements in the preceding paragraph point out the difficulties in species determination within this genus. The small collection of medusae from Lake Tana exemplifies this situation and raises the question: Which is the right size group to be chosen for the determination, an average value or a selected size group? In Figs. 1–3 all specimens from Lake Tana are used to draw the relations of size to number of statocysts (Fig. 1), size to number of tentacles (Fig. 2), and size to ratio of ns/nt (Fig. 3). These graphs show quite clearly the wide range of characters, especially in the ratio of ns/nt, which is believed to be the most important item. Another result is exhibited

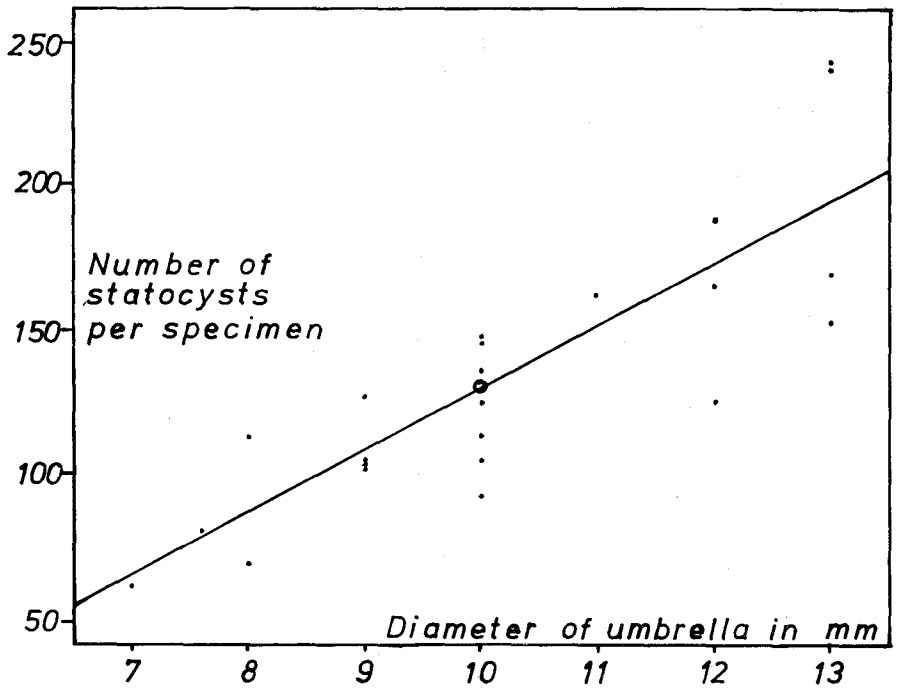

Fig. 1. *Limnocnida indica* from Lake Tana.
Relation of number of statocysts per specimen to diameter of umbrella.
Regression line: $y=83.82+213.27x$
Correlation coefficient: $r=0.2628$
Reliability: $p=0.05$

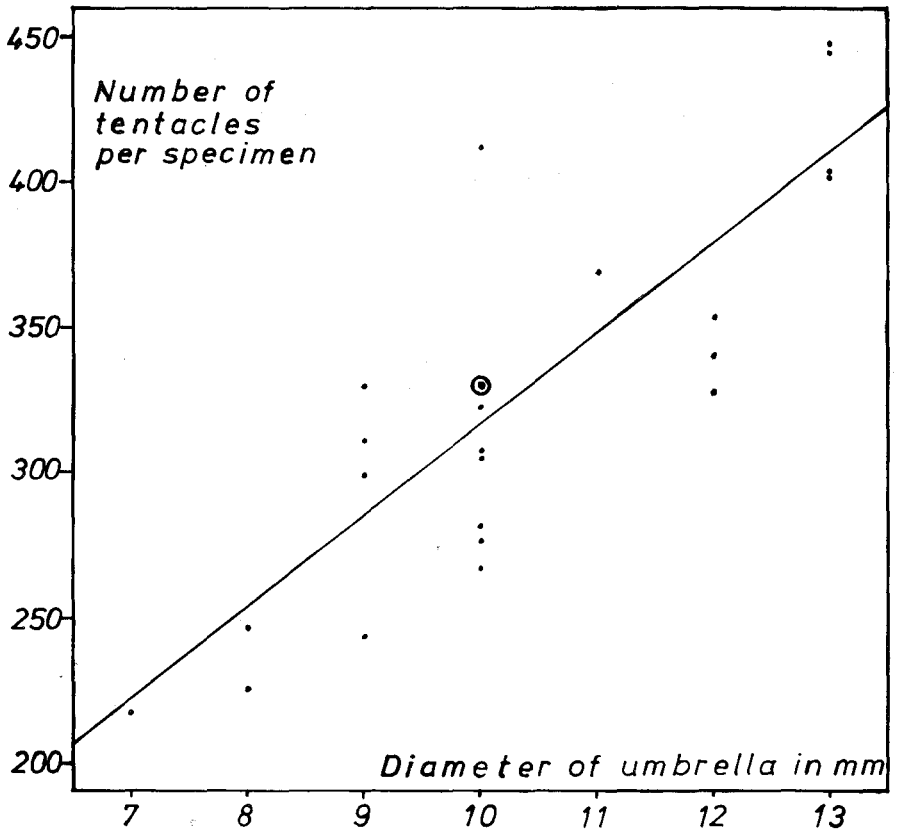

Fig. 2. *Limnocnida indica* from Lake Tana.
Relation of number of tentacles per specimen to diameter of umbrella.
Regression line: $y=5.73+310.33x$
Correlation coefficient: $r=0.8512$
Reliability: $p=0.01$

by the regression lines in Figs. 1 and 2. They show the average increase of statocyst and tentacle numbers with increasing size and—more important—they demonstrate the different slopes, i.e. a change of the ratio ns/nt with size.

No data are available to draw regression lines for other species of this genus. Determination of the Lake Tana medusae therefore is restricted to the use of the numerical values presented in Table 1. The closest relation is found between the characters of the medusae from Lake Tana and those given for *L. indica*. On the basis of our present knowledge the medusae from Lake Tana belong to the species *Limnocnida indica*. This is the first record of this species from the African continent.

Distribution

Both the authors cited above report on the distribution of the different species of *Limnocnida* in Africa, but more localities are summarized by PITMAN (1965) using

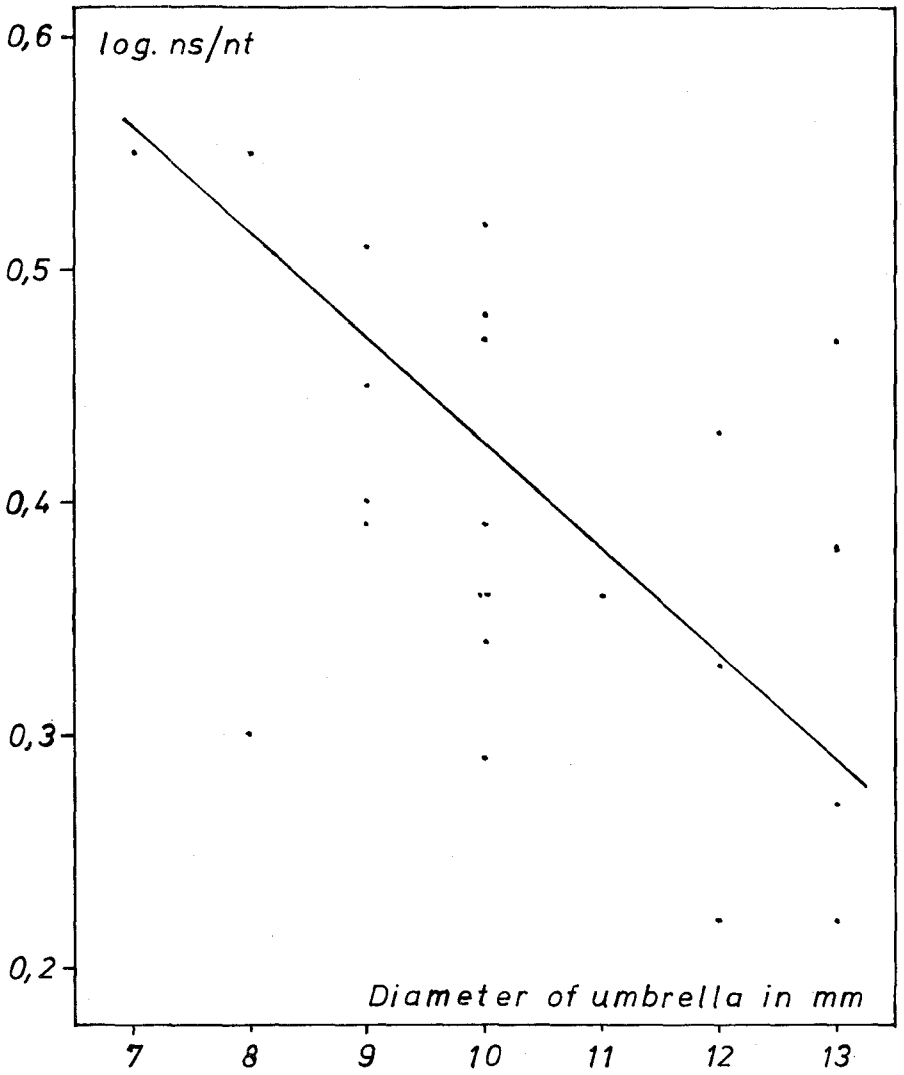

Fig. 3. *Limnocnida indica* from Lake Tana.
Relation of log ns/nt to diameter of umbrella.
Regression line: $y = -0.67929 + 0.27736x$
Correlation coefficient: $r = 0.5218$
Reliability: $p = 0.01$

a number of personal communications from correspondents together with the occurrence as outlined in the literature (PITMAN ascribes all the observations to *L. tanganyicae*).

While in western Africa *Limnocnida* is found as far north as Mauritania, the northernmost locality in eastern Africa has been Lake Victoria. The new record from Lake Tana (1830 m) is some 1500 km north. One could expect a further transport to the north from Lake Tana down the Blue Nile, but this could have happened equally well from Lake Victoria down the White Nile. However, this seems not to be the case, since one of PITMAN's correspondents has taken many plankton samples from the White Nile without any indications of *Limnocnida*.

Summary

1. Characters of the genus *Limnocnida* are discussed and it is pointed out that species determinations are difficult on the basis of published information. Species characters change with increasing size.

2. Species determination and description should include a wide range of size groups. Regression lines of characters to size of medusae should be used instead of average or maximum values.

3. Medusae from Lake Tana (Ethiopia) are determined as *Limnocnida indica*, hitherto known from India only.

4. Lake Tana is the northernmost locality in East Africa in which a species of *Limnocnida* has been observed.

LITERATURE

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DISCUSSION

WEILL: Are there specific differences concerning the structure and/or the size of nematocysts?

THIEL: While the type of nematocysts is mentioned by several authors as heterotrichous, microbasic eurytele the size ranges are given only for the medusae of *Limnocnida tanganyicae* by BOUILLON (1957 b). I include here values for *L. indica* and *L. victoriae* according to my own measurements. In five specimens of each species, 20 nematocysts were examined from each of the five tentacles.

Limnocnida tanganyicae	6.8– 7.4μ in length	2.5–2.7μ in width
Limnocnida indica	9.0–12.3μ	3.4–5.5μ
Limnocnida victoriae	11.4–12.7μ	5.2–6.1μ

These figures show some overlap in length and width for the nematocysts for the latter two species, while there is none with *L. tanganyicae*. No date are known for *L. indica* from India. Further measurements from differeht populations will help to clarify the specific questions in the genus *Limnocnida*.

EDWARDS: In the allied species *Craspedacusta* it is commonly found that a population of medusae may be all male or all female, and it has been assumed that the species is distributed perhaps by birds. In the case of *Limnocnida* is there any evidence to suggest that the species are carried between African lakes, and accordingly that in any particular lake the *Limnocnida* may in different years have been carried there from different lakes?

THIEL: We have no evidence on the type of transport from one lake to the other, but we can assume the same modes as in *Craspedacusta*. I have read nothing about unisexual populations.

MILLARD: I have read that *Craspedacusta* is spread on water-lilies.

THIEL: This may well hold for *Limnocnida* species.

NAGAO: How do you think about the relation between *Limnocnida* and *Craspedacusta?* Both genera have similar polyp stages, but Dr. KRAMP keeps them in separate families.

THIEL: The polyp stages of *Limnocnida* and *Craspedacusta* are very much alike. The distribution of both species seems to be fairly clear and separate that one can be sure on the species by the locality where the polyp is found. The two genera are characterized by their medusae only.

UCHIDA: Concerning the fresh-water medusa, *Craspedacusta sowerbyi*, there is a striking fact that the species occurred quite suddenly in several places in Japan, from Hokkaido to Kyushu after the war. I am of opinion that the medusa was imported in dried condition, such as statoblasts in the Bryozoa and gemmules in the Porifera in fresh water. It is known that the polyp of this medusa, placed in unfavourable conditions, becomes plasmodium. I suppose that the plasmodium becomes dried up and floats in the air, thus in the dried condition it must have been imported into Japan from China or the United States of America. The home of the medusa, however, seems to be China, because it is described in ancient Chinese literature several hundred years ago.

Added in Proof:

KRAMP (1954) published data for *L. tanganyicae* on the ratio of number of statocysts per number of tentacles, which supplement Table 1 and confirm the conclusions. For specimens larger than 3–4mm from Lake Tanganyika and for medusae of 4–10mm in diameter captured in Lake Mohasi he gives values for ns/nt of 0.51–0.66 (average 0.61) and of 0.68–1.35 (average 0.91), respectively.

KRAMP, P. L. 1954. On the freshwater medusa *Limnocnida tanganyicae* and its occurence in African Lakes. Ann. Mus. Congo; Tervuren, Zool, **1**, 207–213.